Building farm resilience: The prospects and challenges of organic farming[1]

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Abstract

The concept of socio-ecological resilience is applied to agricultural systems in general and to the farm level in particular. Resilience has three defining characteristics: the amount of change the system can undergo while maintaining its functions and structures, the degree of self-organization, and the capacity for learning and adaptation. To assess the resilience of a farming system various elements that can build resilience are identified. Using these elements, the paper assesses organic agriculture using the IFOAM Basic Standard. The analysis shows that organic farming has a number of promising characteristics building resilience. However, when analyzing the current development of organic farming practice in light of the effects of government regulation and market dynamics, there is a danger that this quality is lost. Therefore, conversion alone may not be enough to ensure farm resilience. The ability of organic farming to realize its resilience building potential will depend on the ability of the organic movement to adapt and learn from the current experiences.

Key words: sustainability, resilience, organic farming, IFOAM, socio-ecological systems, standards, regulation, market pressures

Introduction

Concern about the environmental effect of intensive farming has led to increased demands for environmentally friendly agricultural production methods. In particular, public attention and policy makers have focused on organic farming as it can provide a combination of environmental, social and economic benefits. This has resulted in a widespread agreement that organic farming displays many elements characterizing a sustainable farming system (see Rossi and Nota, 2000; Stolze et al., 2000; Hansen et al., 2001; Rigby and Cáceres, 2001).

When considering sustainability, there is a growing awareness that in our world, where rapid change seems to be the norm (Meppem and Gill, 1998), the ability to adapt to ongoing change and cope with unpredictability is decisive both for a farming system, as well as for an individual farm. Despite this recognition, and the fact that most definitions of sustainability do not preclude this dynamic aspect, it is seldom the center of attention. On the other hand, resilience focuses explicitly on the

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capacity to change and reveals the shortcomings of a focus on stability and the accompanying command-and-control approach of classical resource management (cf. Holling and Meffe, 1996). To emphasize the adaptive capacity required to achieve sustainability, we focus on the concept of resilience as defined by Holling (1973), i.e. the magnitude of disturbance that can be experienced before a system moves into a different state with different sets of controls. Or, in the words of van der Leeuw (2000: 359), socio-ecological resilience is the "capacity to lead a continued existence by incorporating structural change".

Within the framework of this paper we apply this concept of resilience to the farm level. The goal is to understand which features can be conducive to building farm resilience and which factors of the current socio-economic environment can prevent them from fulfilling their potential. First, we discuss the relationship between sustainability and resilience. Then, we propose characteristics defining farm resilience, and compare these characteristics to the Basic Standards of organic farming, as defined by the International Federation of Organic Agriculture Movements (IFOAM). Finally, we review influences jeopardizing the widespread implementation of the IFOAM understanding of organic agriculture and assess their potential effect on farm resilience.

Sustainability and Resilience

Most definitions agree that to be sustainable, agriculture must be ecologically sound, economically viable and socially responsible. This postulates a multidimensional approach and a systemic investigation conceiving not only single factors but also complex functions and processes with various interactions between elements and (sub)systems, as well as mutual dependencies (von Wirén-Lehr, 2001; Hinterberger et al., 2000).

This implies a real challenge when attempting to operationalize the concept of sustainability, and grasping its complexity has so far been elusive. Further, not only the complexity of the system needs to be considered, but also the dynamic aspect of evolving systems. Indeed, sustainability does not equal fossilization or the perpetuation of a system's state. Sustainable agriculture should not be seen as a set of practices to be fixed in time and space, but must include its ability to cope with change (Pretty, 1997; Hinterberger et al., 2000). This understanding contrasts with various attempts to operationalize the concept of sustainable agriculture and derive management advice for practical application (cf. von Wirén-Lehr, 2001) which implicitly or explicitly work under the ceteris paribus assumption, i.e. that the given framework remains the same. This rather static approach does not emphasize the dynamic aspect, i.e. that the skills required are not just the ability to define goals and measures, but also the necessity to continuously deal with uncertainty, change and adaptation (Pretty, 1997; Hinterberger et al., 2000).

When dealing with issues of change, two types of events can be distinguished: regular causes, i.e. regularities in a system's behavior which allow for prediction or explanation, and singular causes which are particular, unique, often historic events that can change the behavior of a system (Wagner, 1999). This means that sustainability implies not only an enhanced capacity to adapt in the face of changes, but must also cope with unexpected events. Management for sustainability therefore requires confronting multiple uncertainties, considering unpredictability and juggling shifting objectives (Holling, 2001).

In this view, a system's sustainability depends on the ability of ecological and socio-economic systems to cope with changes in both external and internal conditions and implies the capacity to create, test and maintain this adaptive capability (Pretty, 1997; Hinterberger et al., 2000; Holling, 2001). This has led van der Leeuw and Aschan-Leygonie (2000) to emphasize the need to focus on the

resilience of socio-natural systems rather than on their sustainability. This is based on the insight that these two concepts are complementary since resilience is a prerequisite for sustainability. Indeed, resilience, and the resulting capacity to adapt to change, is a key property of sustainability (Folke et al., forthcoming) and therefore the goal is to "build resilience for sustainability" (Folke et al., 1998:434).

In the following discussion the focus is on resilience and the dynamics of systems as they adapt to changing circumstances and by doing so create new opportunities (Holling, 1973; 1994; 1996; Peterson et al., 1998; Berkes and Folke, 1998; Gunderson, 2000; Carpenter et al., 2001). Indeed, there is no such thing as an ever stable system and within the context of agriculture, farmers have always lived in changing environments – politically, economically and ecologically – where surprise and structural change are inevitable.

Three distinctive features of resilient systems have been listed by Carpenter et al. (2001), who note that resilience as applied to integrated systems of people and natural resources has the following defining characteristics:

1. The buffer capacity, i.e. the amount of change a system can undergo while maintaining its functions and structures within the same stability domain. This refers both to the inherent functioning of a system as well as to the elements allowing it to absorb unforeseen events.
2. The degree to which a system is capable of self-organization and networking, as opposed to a lack of organization or an organization imposed by external factors. Indeed, the connectedness or controllability of a network determines the degree to which it can direct its own destiny, as distinct from being caught by the whims of external variability (Holling, 2001).
3. The ability to build the capacity for learning and adaptation. This is embodied in adaptive management, which is an approach to the management of complex socio-ecological systems based on incremental, iterative, experiential learning and decision making, buttressed by active monitoring of outcomes of decisions and feedback from their effects (Jiggins and Röling, 2000).

Definition of farm resilience and its application to organic farming

The question then is how buffer capacity, as well as the capacity for self-organization and adaptability can be built into farming systems. This would enable them to manage processes, dynamics and changes thereby building resilience.

Characteristics of resilience at the farm level

To assess the resilience of organic farming, clear criteria must be defined. Since the point of departure of resilience theory is ecological systems, less information is available on factors defining resilience at the farm level. Therefore, elements of the literature on farming systems (e.g. Röling and Jiggins, 1998; Pretty, 1998; Jiggins and Röling, 2000; Ellis, 2000) and on resilience (e.g. Folke et al., 1998; Levin, 1999; Gunderson, 2000; Carpenter et al., 2001; Holling, 2001) were merged to generate a list of elements that can contribute to farm resilience.

The **first characteristic** defined by Carpenter et al. (2001) is the capacity to absorb change. At the farm level, we define this buffer capacity as mainly dependent on structural factors of an individual farm. It allows a farm to adapt to current changes, and also determines the range of possible future options (Holling, 2001). To prevent the build up of large-scale crisis successful farm management will allow disturbances to enter on a scale which does not disrupt the structure and functional performance of the farm and the services it provides, while allowing for internal renewal (cf. Holling and Meffe, 1996; Berkes and Folke, 1998; Folke et al., 1998). This implies an ability to respond to changes and to adapt to them

in an active way. It includes the following aspects:

- Understanding cycles of natural and unpredictable events, which allows development of ecological knowledge and site-specific management (cf. Röling and Jiggins, 1998). Indeed, farm management based on the knowledge and experience of the farmers and on their long-term relationship with the environment will allow for appropriate practices based on the dynamics of the local ecosystem. This also implies knowledge of the time and space scales of the different recourses that support and feed the farm system (e.g. soil fertility creation and degradation, formation and maintenance of genetic information).
- Diverse and flexible on-farm and off-farm activities to stabilize the farm system (cf. Ellis, 2000). Nurturing diversity allows to spread risks and create buffers. Diversity also plays an important role in the reorganization and renewal process following disturbance (Folke et al., forthcoming).
- Stewardship and socio-ecological management (Folke et al., 1998), e.g. integration of ethic considerations to safeguard against consumer rejection in case of food scares such as foot and mouth disease or bovine spongiform encephalopathy (BSE).

The **second characteristic**, the capacity for self-organization, is understood here as the ability of a group of farms to form a flexible network as well as its ability to be involved with its social, economic and institutional environment. The skills, learning processes, human relationships, and mutual trust that are developed incrementally in this farm network, which emphasizes direct participation of the stakeholders, can build resilience. The existence of such networks also creates flexibility in problem solving and a balance of power among interest groups (Scheffer et al., 2000). This contrasts with powerful centralized institutions and functionally specialized divisions of labor that can hinder resource management reform and adaptive social change (Folke et al., 1998). Also, the tendency for large organizations is to develop rigidities, thus precipitating major crises (Holling and Meffe, 1996; Holling, 2001). This capacity for self-organization includes:

- A limit to the dependence of farms on external institutions for information, knowledge and expertise, rather relying on cooperation and networking between farmers for information exchange and building joint initiatives (Assouline and Oerlemans, 2000; Morgan and Murdoch, 2000).
- Local support networks with roots in the local community can be the basis for a durable relationship with consumers, e.g. through direct marketing. This can replace or complement contract sourcing with supermarket chains or large processing companies and production for the world market (cf. Pretty, 1998).
- Decreased dependence on external inputs, relying on internal nutrient cycles and on-farm feed production, as well as regulating diseases and pests through management practices, rather than relying on synthetic biocides.

Finally, the **third characteristic**, the adaptive capacity, is a component of resilience that reflects the learning aspect of a system's behavior. In the context of farm resilience, we use it to describe characteristics at the individual farmer's level. This is primarily a farmer's management approach, and his/her learning ability. A key element is a feedback mechanism, which enables farmers to receive signals, process and interpret them, and respond with adequate changes in their management practices. Within this context, Gunderson et al. (1995) have suggested adaptive management as the most

promising approach. Adaptive management differs from the conventional practice of resource management by emphasizing the importance of understanding feedback from the environment and systematic (i.e. non-random) experimentation in shaping future actions (Berkes and Folke, 1998). It uses management as a tool not only to change the system, but as a tool to learn about the system. This includes:

- Learning mechanisms: this is the ability of a farmer to respond to signals of change and integrate the experience in an appropriate manner. Its starting point is the farmer's capacity to process information, which is decisive for adaptability (cf. van der Leeuw and Aschan-Leygonie, 2000) and his/her ability to exploit opportunity.
- Feedback mechanisms: incorporating feedbacks in the farm system by monitoring change and responding to signals for change, e.g. from the soil or the consumers. It also requires that the farmer be able to select the relevant signals from the most important forces influencing the system.

Potential of organic farming to build farm resilience

For the assessment of organic farming with regard to farm resilience, we selected the Basic Standards defined by the IFOAM. They include broad and comprehensive statements of objectives and provide elements both of the ideology and the practice of organic farming, in contrast to regulations such as the EU Regulation 2092/91, which present a more narrow view (cf. LeGuillou and Scharpé, 2000). In this broad view, organic farming involves holistic production methods for crops and livestock, emphasizing the use of management practices rather than the use of synthetic off-farm inputs. The principles and ideas on which organic farming is based also include the compatibility with natural cycles, the inclusion of the wider social and ecological impact, the promotion of agro-biological diversity through sustainable production systems and the protection of their ecological context (IFOAM, 2001).

Table 1 compares the IFOAM Basic Standards with the elements that can build resilience on the farm level, which were elaborated above. The table shows that for most criteria, organic farming displays encouraging and promising features and mirrors the characteristics of farm resilience. This socio-ecological resilience derives primarily from the fact that the IFOAM defines organic farming both as a philosophy of life and as a method of production. It therefore represents a holistic approach that does not primarily focus on only one factor, e.g. the profitability of an enterprise, but addresses complexity and integrates a long-term perspective.

Challenges to the resilience of organic farms

Despite these bright prospects for organic practices to build farm resilience, recent trends show that organic farms may no longer form a homogeneous group, as two strategies can be observed (Buck et al., 1997; Coombes and Campbell, 1998; Campbell and Liepins, 2001; Hall and Mogyorody, 2001). On the one hand there are the farms which produce a variety of products and still make their living through niche markets, selling their products directly to the customer and relying on their personal reputation to ensure product integrity. On the other hand, there is a growing group of specialized farms relying on certification and standardized production methods. They tend to focus on specific crops, the greater national and international markets and to sell their produce through supermarket chains. This second group of organic farms displays some characteristics of an industrialized food system and thereby raise the question whether they still display the characteristics of farm resilience. This dichotomy in organic farms seems to result from the effects of two major influencing factors: the establishment of government standards for organic production and the power of market

dynamics. These factors challenging farm resilience are listed in the third column of Table 1 and are discussed below.

The establishment of organic **regulations** was motivated by the recognition that without uniform certification systems the growth of the organic sector would be impeded (Michelsen, 2001). Indeed, standards can further consumer confidence by safeguarding them from "pseudo-organic" products and protect responsible producers from unfair competition (cf. Vogl and Schmidt, 2001). The implementation of government standards has thus set organic foods apart from all other forms of "natural" or "wholesome" products, increased the transparency of production processes and supported the growth of the market for organic foods. From the perspective of green consumerism, this vigorous market for organic products can be seen as a powerful engine for positive change as it can promote greater environmental awareness and responsibility among producers and consumers alike (Allen and Kovach 2000).

However, despite these positive aspects, a number of authors note that government codification of organic production and processing has enabled the implementation of a reductionist view of organic farming and paved the way for the industrialization of the organic (Ikerd, 1999; Guthmann, 2000; DeLind, 2000). In general, standards delineate allowed and prohibited practices and inputs as well as the requirements of a rigorous certification process, but they do not – and cannot – address the philosophy, values and ideological content of the organic movement (Tovey, 1997; DeLind, 2000; Michelsen, 2001). The problem that subsequently arises is that although for many involved, organic farming goes far beyond the standards, one may simply try to reduce organic production to what is included in these standards, i.e. implement the letter of the regulations, not the spirit of organic farming. Indeed, under the dynamics of competitive markets, growers have little incentive to incorporate an ideal practice when an allowable one will suffice (Allen and Kovach, 2000; Guthman, 2000). However, the economic pressures to cut corners can jeopardize ecological soundness and the very characteristics of organic farming that build resilience (see Table 1).

Another effect of government standards is the increasing attractiveness of the organic market for **agri-businesses** and the implication of their specific supply needs and resulting market pressures. Standards are promoted by economists as a means of reducing the cost of market transactions between buyers and sellers – thus improving market efficiency by increasing transparency, retaining consumer confidence and providing a basis for international trade. This is mainly relevant to large-scale producers with geographically dispersed customers supplied through multi-level marketing channels (Ikerd, 1999). Thus, establishment of government grades and standards helps create a competitive advantage for large-scale, industrial producers and clears the way for agri-business capital to become more deeply involved in organic foods (Buck et al., 1997; Guthman, 1998). Indeed, although some organic farmers compete effectively for niche markets, catering to consumers with unique tastes and preferences for local specialty foods, industrial agri-business increasingly dominates the mass distribution of organic foods (Ikerd, 2001). Although the availability of organic foods in many supermarkets has enabled a strong development of the organic market and has put organic foods at the reach of an increasing number of consumers, the involvement of agri-businesses has two critical side-effects:

On the one hand, contract sourcing by supermarket chains and organic stores, as well as production for international markets, are at odds with localized, place-based agro-food networks (Goodman, 2000). A change in the level at which product commercialization takes place and the development of international trading can be a serious threat to the regional coherence and dynamics (van der Leeuw and Aschan-Leygonie, 2000; Oppermann, 2001).

On the other hand, supermarkets and specialty chain retailers prefer to deal with suppliers that can provide a variety of high quality products, of consistent grade, uniformly packaged, delivered on a timely basis and at a competitive price. This market logic favors producers who can provide large quantities of specific products, who use standardized methods to ensure consistent and uniform quality products and who centralize the control of production and distribution processes to ensure dependable and timely delivery (Ikerd, 2001; Opperman, 2001). Thus, the competitive advantage lies with large-scale**,** specialized organic production systems that can achieve economies of scale and reduce costs.

However, a high level of agricultural specialization is generally considered to reduce a system's resilience. Heavy specialization may lead to more success against competition, but it also increases the system's vulnerability to perturbations, even weak ones, and decreases its adaptability as a low level of diversification implies a narrower range of adaptive possibilities (Levin, 1999; van der Leeuw and Aschan-Leygonie, 2000).

Trends towards increasing **specialization** and higher productivity may also negatively affect the environmental impact claims of organic farming. Generally, low self-sufficiency in feed and problems with certain organic production systems can lead to some environmental effects being similar to conventional farming (e.g. Berentsen et al., 1998; Stolze et al., 2000; Kirchmann and Thorwaldsson, 2000; Edwards-Jones and Howells, 2001; Hansen et al., 2001). Also, farm resilience is further threatened by the widespread dependence on off-farm purchased inputs from specialist suppliers which are refashioning the organic sector into yet another industry dependent on external resources (Guthman, 1998; Goodman, 2000).

The growing market for organic produce, the government subsidies offered e.g. in some European countries as well as the increased availability of organic farm inputs makes it an attractive alternative to conventional production for many farmers. The decision to farm organically is thus not necessarily a result of a search for a holistic perspective on agriculture (Jansen, 2000; Rigby and Cáceres, 2001), which can affect how organic farming is implemented.

This leads to a further effect of economic pressures: even though farmers might be interested in a more comprehensive approach to organic farming, agronomic challenges, labor requirements, market constraints and organizational difficulties limit their practical choices for the organization of their farms (Schneeberger et al., 2002). This can tempt farmers to implement technical prescriptions derived from controlled and uniform conditions, supported by limited cases of success, which are then applied widely with little or no regard for diverse local needs and conditions.

However, for organic farming to live up to its resilience building potential, it must find enabling conditions for locally-generated and adapted technologies, distancing itself from standardized production methods (Pretty, 1997) and conventional farm management approaches. Indeed, if conventional farm management has been successful in increasing yields and economic returns in the short term, it has not been very successful in safeguarding the dynamic capacity of farming systems or in managing socio-ecological systems for resilience and sustainability (cf. Folke et al., 1998). Typically, to supply markets, farm management aims at controlling a target resource (e.g. grain production) by reducing its variability. This helps meet production targets and economic objectives. However, this management approach, devoted to production efficiency, becomes more rigid and less responsive to environmental feedback. Thus, the very success of management, effective in the short term, "freezes" the farm at a certain state by actively blocking out environmental variability and feedback that governs change (cf. Holling and Meffe, 1996; Berkes and Folke, 1998).

Conclusion

The concept of socio-ecological resilience can be applied at the farm level and organic farming as defined by the IFOAM has a high potential to promote farm resilience as each of the identified resilience building characteristics is mirrored in recommendations included in the Basic Standards. However, organic farming has come under pressure from two sides (Jansen, 2000). From outside the movement, regulations and agri-business are gaining influence in setting the conditions for organic production. From inside, another type of farmer is emerging and a "conventionalization" of the farm management approach is taking place. These pressures can threaten the ability of organic farms to realize their resilience building potential.

The question then is how the two dominant influences, i.e. regulation and market forces, instead of being a hazard, can be used to promote organic farming, triggering reorganization and transformation. Indeed, neither the policy environment nor the market forces undermine the resilience-building potential of organic farming in their own right. Although some of their effects can be counterproductive, other developments have the potential to further organic farming by promoting social-ecological learning, spreading the appeal of its core values and therefore supporting an increasing number of farmers to implement a holistic organic approach. The resilience of the organic movement will be demonstrated in its ability to turn its distinctive features, i.e. the holistic approach, its formal standards and its market appeal into strengths. The issue is not the definition of standards, but the ownership of the development process and the handling of the defined standards (Vogl and Schmidt, 2001). Similarly, the market can be a catalyst for positive political and social change, e.g. by increasing the number of potential participants or by using the involved businesses as a source of funds for activities supporting organic farming (Allen and Kovach, 2000).

The challenge is to secure resilience and the adaptive capacity-enhancing interplay between disturbance and diversity, between change and persistence (Folke et al., forthcoming). Times of crisis and externally driven change are opportunities for learning, and socio-economic feedback should be used to gain a better understanding of the system dynamics, build this knowledge into the organic movement, update assessments, modify policy and create new feedback loops at various scales.

The resilience of the international and national organic movements is intricately linked to resilience at the farm level, as the organic movement strongly influences the conditions within which farmers operate. At the same time, the resilience of the organic movement depends on its connection, communication and interactions with farmers to maintain integrity, and allow knowledge systems to accumulate and be transferred over time. Indeed, creative ideas and innovative people have always been at the heart of the organic movement. Under conditions of crisis, this cross-scale dynamic must facilitate constructive change by identifying and reducing destructive constraints and inhibitions on change, protecting and preserving the accumulated experience and stimulating innovation (Holling, 2001).

Thus, the capacity of organic farming to build farm resilience will depend on the flexibility of the organic farming movement allowing it to cope, innovate and adapt and the ability of its farmers to develop an alternative food system that can coexist with the global industrial food system rather than being co-opted by it.

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Table 1: The characteristics of farm resilience and matched aspects of the IFOAM Basic Standard as well as trends potentially compromising resilience of organic farms.

Characteristics of farm resilience	Matched aspects of the IFOAM Basic Standards	Trends potentially compromising resilience of organic farms
Buffer capacity		
Understanding cycles of natural and unpredictable events	• Work compatibly with natural cycles • Practical farming skills, based on site-specific knowledge, observation and experience • Pest control by protection of natural enemies of pests through provision of favorable habitat	• Reliance on external expertise and standardized production methods • Specialization and pressure to increase productivity reduces variability and pushes ecological concerns in the background.
Diversity and flexibility	• Maintain and promote agro-biological diversity by increasing the number of crop and plant varieties and animal breeds • Create a balance between crop production and animal husbandry • Positive interaction of all farm activities	• Decrease of mixed farming, increasing specialization • Product definition and standards limiting farmers' crop choices
Stewardship	• Harmonious relationship between land, plants and livestock • Respect for the physiological and behavioral needs of livestock • Social justice in production and processing	• Since externalities are not taken into account, economic pressures can lead to shorter-term planning
Ability to self-organize		
Independence from external institutions for information	• Recognize the importance of indigenous knowledge • Varieties and species adapted to local conditions	• Dependence on central administration and institutionalized farmer associations • Domination by supermarkets threatens regional coherence and dynamics
Local market networks	• Foster local and regional production and supply chains	• Contract production for the agro-food industry
Independence from external inputs	• A wide range of crops and varieties should be grown to enhance sustainability, self-reliance and biodiversity • Return microbial plant or animal material to the soil to increase fertility • Practice based on skills and knowledge can avoid requirement for external inputs • All feed should come from the farm itself or be produced within the region	• Specialization and provision of large batches of produce often require standardized production methods facilitated by purchased inputs. • Often central and large scale production facilities for farm supplies, resulting in long transport routes • Standards require only a certain amount of feed to be produced on-farm
Capacity for learning and adaptability		
Learning mechanisms	• Operators should develop meaningful experience, knowledge and ideas about promotion of ecosystem and landscape quality on their farm	• Reliance on technical prescriptions derived from controlled experiments • Focus on minimum requirement by standards
Feedback mechanisms	• Operators should be aware of the main characteristics, functions and processes that produce and maintain that quality and try to support and enhance these processes	• Focus on market signals • Negative impacts on the environment tend to be ignored as they are not honored by the market